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College of Agriculture, West Virginia University

HENRY G. KNIGHT, Director

Morgantown

Chemical Analyses and Fertility of West Virginia Soils

(Technical)

BY

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Chemical Analyses and Fertility of West Virginia Soils[1]

In 1914 the Department of Soils of the West Virginia Agricultural Experiment Station began a chemical and field study of the important agricultural soils in the State[2]. Experiment Station Bulletins 161 and 168, dealing with this investigation, have already been published. The present report is a continuation of these investigations and includes the results of the analyses of 485 soil samples representing the important soils in the State. The data given in the two previous bulletins have been revised, and a number of corrections have been made. The revised data are included in this report.

Of all the nutrients required by plants from the soil, nitrogen, phosphorus, and potassium are the ones most liable to be deficient. This deficiency may be due to insufficient amounts of these elements in the original soil material; to the removal of these elements through the sale of farm products; or to losses due to the processes of leaching and erosion. In this investigation, the content of nitrogen, phosphorus, potassium, and carbon, as well as the requirement of lime, was determined. The results thus found have been compared with the fertility. The organic carbon was determined in order to ascertain whether or not a correlation existed between either the carbon and the nitrogen, or the carbon and the fertility, of the soils. Calcium as a nutritive element in the soil is seldom deficient as such, but many crops are often limited because of the lack of calcium carbonate to neutralize the acidity. For this reason, the lime requirement was determined.

The availability of the different plant nutrients varies with the crops grown, and the treatment of the soil; hence, no attempt was made in this investigation to determine the immediate availability of the plant nutrients. With soils of similar conditions and treatments it seems that the nutrients would become available in proportion to their amounts present in the soil. However, there are exceptions to this which have not been satisfactorily explained.

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[1] O. C. Bryan, the senior author resigned as assistant Soil Technologist, West Virginia Agricultural Experiment Station, August, 1923.

[2] This investigation was started by Professors Firman E. Bear and R. M. Salter who are now on the faculty of Ohio State University. The authors wish to express their appreciation to them; to Messrs. M. F. Morgan, H. J. Barnett, C. F. Wells, E. B. Wells, R. E. Stephenson and to others who assisted in the progress of this work.

The methods used in collecting the soil samples and in analyzing about two-thirds of the soils are described in West Virginia Agricultural Experiment Station Bulletin 159. For the remaining one-third, the same analytical procedures were followed in determining the nitrogen and carbon, but a modification of Hillebrand's methods[1] for phosphorus and potassium proved to be shorter and was, therefore, used. The lime requirement was determined by the Veitch method. Field records were kept of the soil treatment, the crops grown, and the general fertility of the areas from which the samples were taken. In some cases, however, the field men were unable to secure all of this information.

The classification of the soils into provinces and series is essentially that described by the United States Bureau of Soils[2]. Some of the counties in the state have not been surveyed and for this reason a few soils may not be classified correctly. The field men could not always follow the classification used by the Bureau. According to the Bureau of Soils, West Virginia is divided into three provinces in each of which the soils have been produced by the same force or group of forces. Within each province there are several series which are groups of soils having a similar color, character of subsoil, relief, and origin. Soils of the same series may differ in texture. Soils of the same texture in a series form a soil type. Thus a clay loam in the Upshur series would be Upshur Clay Loam type.

The description of the provinces and important series in West Virginia has been abstracted from Bulletin 96 of the United States Bureau of Soils as follows:

LIMESTONE VALLEYS AND UPLANDS PROVINCE

The soils in this province were derived from the limestone formations in the eastern section of the State, including portions of the Eastern Panhandle and of counties along the Virginia border line. Soils of this province are also found, in small areas, in other sections of the State, particularly in the northern counties, including the Northern Panhandle. These soils vary from gently rolling lands to hills. They are well drained and are fertile.

Brooke Series

The soils in this series are grayish-brown to brown, with yellowish-brown to slightly reddish-brown subsoils. They were derived from pure limestone, with occasional admixtures of material from sandstone and shale. This series is typically developed on the crest of ridges and hills, and in plateau-like situations. They have good drainage, are easy to cultivate, and are fertile.

[1]United States Department of Interior, Bulletin 700.
[2]United States Bureau of Soils, Bulletin 96.

Hagerstown Series

The surface soils in this series are prevailingly brown in color, with light-brown to reddish-brown subsoils. They were derived from the limestone formations located in the eastern section of the State. They have an undulating to gently rolling surface, and are well drained. These soils are very fertile and are admirably adapted to general farming.

APPALACHIAN MOUNTAINS AND PLATEAU PROVINCE

The soils in this province were derived from the disintegration of the sandstones and shales of the Appalachian mountains and plateaus. They have a rolling to mountainous surface which is well drained. They are not very fertile.

Dekalb Series

The surface soils of the Dekalb series are gray to brown, while the subsoils are some shade of yellow. They are derived from sandstones and shales. The surface consists of gently rolling lands, table-lands, hills, and mountains. They are well drained, but are not very fertile.

Meigs Series

This series is variable in character and particularly in color, ranging from Indian red to a pale gray. This series includes some Upshur and Dekalb soils and intermediate types. The soils were derived from red and gray sandstones and shales. They are prevailingly steeply rolling, or mountainous. Some of the smoother slopes are suitable for farming, but are not very fertile.

Upshur Series

Both the surface and subsoil of this series are Indian red. Some types have a grayish-red surface. They were derived from Indian red sandstones and shales, frequently of a calcareous nature. The surface is rolling to mountainous, well drained, and is generally more fertile than the corresponding members of the Dekalb series.

Westmoreland Series

The soils of this series consist of a grayish-brown to a yellowish-brown surface, and a yellowish-brown to yellow subsoil. The surface soils have a mellow structure and the subsoils have a friable structure. They were derived from sandstone and shale with interbedded limestone and calcareous shale. The topography ranges from gently rolling lands to steep hills. They are well drained and are fertile.

RIVER FLOOD PLAINS PROVINCE

These soils are variable in color, drainage, and fertility. They consist of washed material from limestone, sandstone, and shale soils, and form strips of varying widths along rivers and streams.

Elk Series

The soils of this series have a light-brown to brown surface, and a pale-yellow to yellow subsoil. They are above the overflow but are entirely alluvial. These soils were derived from limestone, sandstone, and shale soils. Gravel is generally found in the substratum. The soils are level to slightly rolling, and have poor drainage in wet seasons. When properly managed and well drained, these soils are fairly fertile.

Holston Series

These soils have a yellowish-brown to brown surface, and a yellow subsoil. They are entirely alluvial, consisting of material washed from sandstone and shale soils. They are above the overflow and are fairly well drained. In general, they are less fertile than the members of the Elk series.

Tyler Series

The surface soils are grayish-brown, while the subsoils are yellowish to mottled gray. Some of these soils have a slightly plastic structure. They consist of material washed from sandstone and shale soils. They are fairly level, and poorly drained in many cases. These soils are best suited to grazing and hay. They have a fertility about equal to the Holston series.

Wheeling Series

The soils of this series are brown to yellowish-brown with a slight difference between the surface and subsoil. They are underlain with gravel, usually within three feet of the surface. These soils are alluvial, consisting of material washed from the glaciated area along the Ohio and other rivers. These soils have good drainage and are fertile.

Huntington Series

These soils are light-brown to brown. The subsoils are yellow to light brown. They consist of material washed from limestone, sandstone, and shale soils. They represent the best drained soils of the first bottom and are very fertile.

Moshannon Series

These soils comprise the reddish-brown to Indian red first bottom alluvial soils. They were derived largely from material washed from the Dekalb soils, but they sometimes contain washed material from limestone soils. They are fairly well drained and are fertile.

The greater portion of the soils in the State are composed of the Dekalb, Meigs, and Upshur series as will be seen in Table 1, which gives the area of the different series that had been surveyed in West Virginia up to 1921.

Table I.—Area of the Different Soil Series Surveyed in West Virginia.[1]

	Number of Acres Surveyed to 1921
Brooke	46,594
Colbert	960
Decatur	4,992
Frankstown	43,392
Frederick	16,384
Hagerstown	123,136

[1]The samples from Berkley, Jefferson, and Morgan counties were collected before the survey was completed in these counties and it is possible that some of the soils classified as Dekalb series in this report belong to the Berks series. The Frankstown and Frederick series are of limestone origin and somewhat similar to the soils in the Hagerstown series. Very likely some of the soils classed as Hagerstown series belong to the Frankstown, or Frederick series. The Berks, Frankstown, and Frederick series have been noted in this state only in the Eastern Panhandle.

Berks	41,856
Dekalb	5,028,224
Meigs	2,896,512
Rough stony land	947,136
Steep broken land	53,696
Lickdale	1,216
Upshur	581,120
Westmoreland	183,488
Atkins	11,712
Elk	35,840
Holly	28,928
Holston	140,352
Huntington	385,280
Moshannon	129,280
Pope	62,280
Tyler	60,672
Riverwash	2,432
Wheeling	40,768
TOTAL	10,866,250

This table was furnished through the courtesy of the U. S. Bureau of Soils.

RESULTS

The nitrogen, phosphorus, potassium, and carbon are given as percentages in this report rather than as pounds per acre, as was the case in the two previous bulletins. On the basis of 2,000,000 pounds of soil per 6 2-3 acre inches, 1 per cent equals 20,000 pounds and .1 per cent equals 2,000 pounds. The analyses do not include the mineral, rock, and organic particles which would not pass a 2mm. sieve.

The chemical analyses and field data of the various soils are given in Table II. The most important information in this table is the total store of the plant nutrients (nitrogen, phosphorus, and potassium) and the lime requirement. These are an index to the potential fertility of the soils. In general, the higher the content of nitrogen and phosphorus and the lower the lime requirement, the greater the fertility, provided the drainage and other factors are favorable. The crop yields observed by the owner of the land and by members of the Soils Department are used as a basis to determine the fertility which is compared with the chemical analyses. There seems to be a fairly definite correlation between the amounts of plant nutrients present and the crop yields on those soils which have like conditions and treatments. This is particularly true with the soils in the same province. A similar correlation with soils in other provinces has been noted by previous investigators.[1] The

[1] U. S. Bureau of Soils, Bulletin 54, and annual reports of field operations from 1903 to 1907.

data indicate a low fertility when the phosphorus is less than .04 per cent, and the nitrogen less than .12 percent.

Table II shows that the average soils in the Dekalb, Meigs, Upshur, Tyler, and Holston series are relatively low in nitrogen and phosphorus. The Tyler and Holston series belong to the River Flood Plains Province, but compare favorably in fertility with the sandstone and shale soils. The Upshur series frequently has calcareous formations and is a little more fertile than the strictly sandstone and shale soils. The Elk and Pope series also belong to the River Flood Plains Province, and sometimes contain material washed from limestone formations. They are more fertile than the Tyler and Holston series. About 50 per cent of the Dekalb and Meigs series, 33 per cent of Holston, Tyler, and Upshur series, and about 30 per cent of the miscellaneous soils have less than .04 per cent phosphorus. More than 45 per cent of the soils in the Dekalb, Meigs, Holston, and Upshur series contain less than .12 per cent of nitrogen. More than 90 per cent of all the sandstone and shale soils are acid, and require an average of 3000 pounds of lime per acre to neutralize the acidity. Practically all of the soils in the above series are of low fertility.

The data in Table II indicate that most of the well drained soils that are low in nitrogen and phosphorus will respond favorably to acid phosphate and nitrogenous fertilizers. Most of the acid soils will not grow clover without lime and, in many instances, without phosphates. Field experiments in West Virginia[1] and in Pennsylvania[2] show that the Dekalb soil responds favorably to phosphates, and nitrogen, and in a lesser degree to potassium and lime. Very likely all of the well drained soils which have as low phosphorus and nitrogen content and as high a lime requirement as the average of the Dekalb series will respond favorably to fertilizers containing phosphorus, nitrogen, and potassium. Poor drainage conditions, no doubt, limit the productivity of the Tyler and Holston soils in many cases. Most of the soils studied are fairly high in potassium. A few of them are low in this nutrient, and will probably respond to potash fertilizers. All of the soils which are low in organic matter will likely respond to potash fertilizers.

The organic matter seems to be a good index to the nitrogen content and is no doubt an important factor in determining the fertility. The percentage content of organic matter may be calculated by multiplying the carbon content by 1.724.

[1] West Virginia Agricultural Experiment Station, Bulletin 155.
[2] Pennsylvania Agricultural Experiment Station, Bulletin 166.

The content of nitrogen varies from 8 to 10 per cent of that of the organic carbon in practically all the soils studied. Some of the sandstone and shale soils have a high content of nitrogen, phosphorus, potassium; and a low lime requirement, yet produce poor crops. This is possibly due to poor management, or to unfavorable drainage conditions.

The Brooke, Hagerstown, Westmoreland, Huntington, Moshannon, and Wheeling soils are much more fertile than those of sandstone and shale origin. They have a higher content of nitrogen and phosphorus and are in general, less acid. All of these, except the Wheeling series, have wholly or partly a limestone or calcareous origin. The last three named soils belong to the River Flood Plains Province, but compare well in fertility with those of strictly limestone origin. The phosphorus in all these soils averages .06 per cent, or more and the nitrogen about .15 per cent. The high content of phosphorus in the limestone soils is probably due to a more rapid leaching of the carbonates than of the phosphates. The correlation between the high content of phosphorus, nitrogen, and lime carbonate, and the fertility has been noted by McHarague and Peter[1] and others. Some of the limestone soils, however, will respond to nitrogen and phosphate fertilizers as is indicated in Table II.

The organic carbon in the Hagerstown soils averages less than that in any of the other series. This is perhaps due to a very rapid decomposition of the organic matter, brought about by the presence of calcium carbonate. The content of nitrogen averages about .12 per cent of that of the organic carbon in the Hagerstown solis, and from 8 to 10 per cent of that of the average soils in the other series. Most of the limestone soils have a good supply of potassium. Indeed, some of them are very high in this nutrient. However, those which are low in organic matter will probably respond to potash fertilizers.

The average content of nitrogen, phosphorus, potassium, and carbon, and the lime requirement of the important soil series in West Virginia are given in Table III (page 21). The general fertility of the series is also indicated in this table.

[1]Kentucky Agricultural Experiment Station Bulletin 236.

TABLE II.—Chemical Analyses and Field Data of West Virginia Soils Arranged According to Series.

LIMESTONE VALLEYS AND UPLANDS PROVINCE

BROOKE SERIES

Soil No.	Percentage of Elements N	P	K	C	Req'm't $CaCO_3$ Lbs. Per A.	Kinds and Amounts of Fertilizers Used	Crops Generally Grown and Yield		Owner, Address, and County
42	.182	.068	2.40	2.65	0	Some M	Corn, wheat, hay	F	R. Patterson, Wellsburg, Brooke
64	.150	.077	2.01	1.50	0	None	Corn, wheat, clover	G	A. F. Bonar, Belleville, Wood
114	.153	.056	1.56	1.54	2800	Some M, AP, L	Corn, oats, timothy	F	W. Brady, Collier, Brooke
172	.214	.076	0.85	2.01	3000	Med amts AP, L	Alfalfa	G	A. R. Jacobs, Short Creek, Ohio
360	.191	.064	1.92	1.96	3800	None	Oats, clover	F	De Garmo Bros., Wellsburg, Brooke
361	.191	.043	1.86	1.99	0	None	Pasture for 10 years	F	G. Bowers, Wellsburg, Brooke
365	.152	.065	1.41	1.46	3200	Med amts L, heavy M, AP	Truck crops	G	Ohio Co. Home Farm, Roney's Point, Ohio
Ave.	.176	.064	1.71	1.87	1800				

HAGERSTOWN SERIES

5	.120	.061	2.55	1.35	0	Some M, AP	Corn, rye, pasture	F	C. D. Wysong, Shepherdstown, Jefferson
24?	.117	.081	2.03	0.98	1000	Med amts 4-8-4 yearly	Orchard, grass	G	J. Miller, Martinsburg, Berkeley
28	.104	.101	2.69	0.77	800	Med amts 4-8-4 yearly	Orchard, grass	G	J. Miller, Martinsburg, Berkeley
29	.111	.054	2.45	1.15	0	4-10-8 occasionally	Orchard, clover	G	Mrs. Lupton, Martinsburg, Berkeley
32	.107	.064	2.48	1.08	0	400 lbs 2-10-8 yearly	Orchard, clover	G	J. W. Stewart, Tablers, Berkeley
33	.114	.045	5.44	1.19	1000	Some M & 4-10-8	Orchard, clover	G	D. G. Miller, Inwood Station, Berkeley
36?	.144	.052	2.75	1.58	2200	Some M & comp fert	Orchard, clover	G	H. L. Smith, Martinsburg, Berkeley
37?	.124	.066	2.75	1.36	2200	Some M & comp fert	Clover, orchard	G	Gr't. Golden Or. Co., Martinsburg, Berkeley
38	.154	.055	2.63	1.52	0	Heavy amts comp fert	Orchard, clover	G	Gray Silver, Martinsburg, Berkeley
47	.144	.064	1.37	1.32	1200	Some M	Bluegrass pasture	G	H. G. Murrill, Lewisburg, Greenbrier
121	.275	.078	1.38	3.14	200	Some M, AP	Corn, wheat, clover, timothy	G	W. G. Cochran, Onoto, Pocahontas
127	.132	.041	0.47	1.59	100	Some M, AP	Corn, grain, clover	G	J. D. Humphry, Ronceverte, Greenbrier
135	.154	.076	0.66	1.66	1100	None	Not cropped	G	Baxter Neil, Gap Mills, Monroe
136	.203	.068	0.74	2.13	400	None	Bluegrass and clover pasture	G	R. C. Scott, Sinks Grove, Monroe
138	.100	.053	0.94	1.32	1900	None	Corn, grain, clover	G	C. A. Kadel, Union, Monroe
192	.191	.052	2.37	1.01	0	M every 3-4 years	Corn, wheat, clover, timothy	G	J. Harman, Franklin, Pendleton

Med amts—Medium amounts
100 to 300 lbs. fert. per acre
1 to 4 tons manure per acre
500 to 2000 lbs. lime per acre
Heavy amts—Heavy Amounts
More than 400 lbs. fertilizer per acre
More than 5 tons of manure per acre
More than 3000 lbs. lime per acre

M—Farm manure
AP—Acid phosphate
L—Lime
Fert—Fertlizer
Comp fert—Complete fertilizer
Some—Irregular applications

The crops listed are the most recent ones grown:
G—Good yield (more than 50 bus. corn per acre).
F—Fair yield (30 to 50 bus. corn per acre).
P—Poor yield (less than 30 bus. corn per acre).
*—Soil drainage is not good.
?—Soil possibly belongs to another series.

Known complete fertilizer formulas given as 4-8-4, N, P_2O_5, K_2O

199	.131	.050	1.55	0.94	0	None	Corn, corn, bluegrass	G	J. Callahan, Martinsburg, Berkeley
200	.143	.082	1.37	0.74	0	Some AP, L, M	Corn, wheat, clover, bluegrass	G	J. W. Small, Bedington, Berkeley
201?	.179	.051	1.44	0.98	0	Some AP, L	Corn, wheat, clover	G	I. W. Small, Bedington, Berkeley
202	.118	.044	2.41	0.54	0	Some AP, M, L	Corn, wheat, clover	G	A. R. Tabler, Martinsburg, Berkeley
203?	.083	.030	2.85	0.42	900	Some M, AP	Corn, grain, clover	F	A. R. Tabler, Martinsburg, Berkeley
205	.128	.060	5.06	0.75	0	AP for wheat	Corn, wheat, clover	G	Flo. Ramsburg, Martinsburg, Berkeley
207?	.123	.032	1.71	0.71	0	Med amts M & 8-10-0	Corn, grain	G	Downey & Thompson, Jones Springs, Berk'ly
209	.111	.054	4.01	0.52	0	None	Virgin soil (Good)	—	Wm. Rider, Halltown, Jefferson
211	.179	.151	3.45	1.07	0	Heavy amts M, AP	Potatoes, rye	G	N. T. Snyder, Shenandoah Jct., Jefferson
212	.103	.046	4.84	0.54	200	Some M, AP, L	Corn, wheat, clover	G	Ed. Jarrett, Shepherdstown, Jefferson
214?	.113	.099	1.91	0.62	0	None	Virgin soil (Good)	—	————, Bakerton Ridge, Jefferson
216	.132	.054	5.54	0.67	1000	Some M, AP	Corn, wheat, clover, timothy	F	R. Gearhardt, Charlestown, Jefferson
217	.118	.045	2.92	0.64	0	Some M	Corn, wheat, clover	G	H. McDonald, Summit Point, Jefferson
218	.204	.055	1.92	1.02	0	Some M	Corn, wheat, clover, grass	G	I. S. Carr, Middleway, Jefferson
Ave.	.138	.062	2.48	1.11	500				

APPALACHIAN MOUNTAINS AND PLATEAU PROVINCE

DEKALB SERIES

2	.111	.035	1.42	1.14	3000	None	Timothy, grass	P	W. Va. U. Farm, Morgantown, Monongalia
9	.083	.034	1.31	0.88	1200	Med amts M	Grain, clover	F	J. A. Creel, Davisville, Wood
10	.113	.044	0.90	1.46	2400	Some L, M	Corn, wheat, clover, timothy	F	Mr. Henry, Stotlers Cross Roads, Morgan
16	.103	.036	1.30	1.15	3000	None	Corn, wheat, clover	P	W. Va. U. Farm, Morgantown, Monongalia
17	.111	.039	1.51	1.90	4000	None	Weeds, orchard	F	Somer's Orchard, Cherry Run, Morgan
19	.117	.046	1.48	1.57	1200	None	Orchard, clover	F	Somer's Orchard, Cherry Run, Morgan
26	.022	.027	1.19	1.10	2400	Some AP, 4-10-7, L	Orchard	P	Black Cr. Or. Co., Hedgesville, Berkeley
39	.060	.021	0.53	1.26	2200	Heavy amts comp fert	Corn, buckwheat, clover	F	B. H. Fleshman, Fayetteville, Fayette
52	.103	.061	1.33	1.01	2000	None	Pasture	G	R. Pickens, Ravenswood, Jackson
58	.156	.037	0.92	1.59	4600	None	Grass, clover	F	L. V. Showver, Corliss, Fayette
61	.104	.043	0.80	1.52	2400	None	Sedge, grass	P	Jones's Estate, Oak Hill Fayette
65	.130	.033	0.56	1.62	2200	Some comp fert	Corn, grain, hay	F	L. P. Wills, Mt. Cove, Fayette
66	.168	.034	1.00	2.36	1400	Heavy amts M, AP, L	Corn, wheat, potatoes	G	A. F. McMillen, Masontown, Preston
67	.216	.109	1.30	2.36	1600	Med amts AP, M, L	Corn, oats, pasture, hay	G	S. Watson, Masontown, Preston
70	.193	.060	1.35	2.07	400	Med amts AP, L, M	Grain, buckwheat, potatoes	F	Preston Co. Farm, Kingwood, Preston
72	.207	.056	1.17	2.48	2600	Med amts AP, M. L	Potatoes, oats, buckwheat	F	J. A. Hodge, Terra Alta, Preston
74	.076	.018	0.86	1.06	1000	Some M	Corn, wheat, clover	P	Perry Lawson, Milton, Cabell
87	.137	.035	1.10	1.60	3200	None	Corn, wheat, bluegrass	P	A. Sheets, Lost Creek, Harrison
91	.245	.061	1.11	2.65	1800	None	Pasture	F	A. H. Davidson, Lost Creek, Harrison
92	.157	.045	1.29	1.60	1600	None	Bluegrass pasture	F	A. H. Davidson, Lost Creek, Harrison
93	.095	.029	1.11	1.09	1000	Some L	Corn, wheat, timothy	F	S. F. Romine, Washington, Wood
97	.106	.024	1.37	1.14	2200	Med amts AP	Timothy, grasses	F	C. C. Hardman, Spencer, Roane
104	.152	.039	1.13	1.46	2200	None	Meadow, corn, wheat	F	S. S. Fans, Bridgeport, Harrison
105	.115	.035	1.11	1.18	0	Some M	Oats, corn, wheat, timothy	P	W. S. Metz, Ravenswood, Jackson
107	.130	.033	1.29	1.43	2000	Some AP	Fruits, vegetables	F	L. Milam, Charleston Kanawha
108	.111	.022	0.83	1.52	1600	None	Orchard, clover	F	W. H. Lawson, Charleston, Kanawha
109	.169	.033	1.01	1.97	2800	Some AP	Corn, grain, timothy	F	J. B. Kesler, Clifty, Fayette
120	.198	.066	0.56	2.66	5200	Med amts AP, M	Corn, wheat, clover, timothy	P	W. G. Cochran, Onoto, Pocahontas

DEKALB SERIES (Continued)

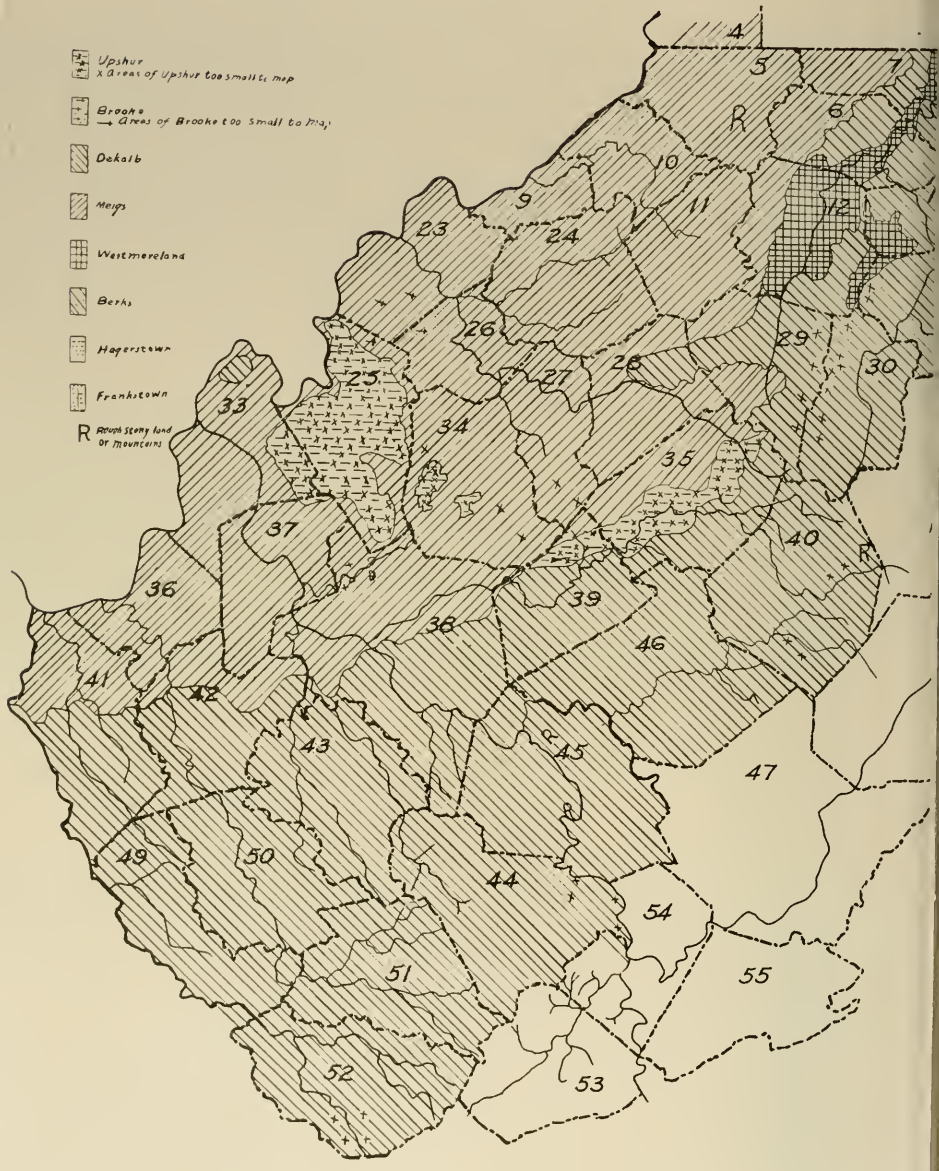
Soil No.	Percentage of Elements N	P	K	C	Req'm't $CaCO_3$ Lbs. Per A.	Kinds and Amounts of Fertilizers Used	Crops Generally Grown and Yield		Owner, Address, and County
131	.091	.027	0.45	1.32	2000	Some AP, L, M.	Corn, wheat, clover, timothy	F	E. W. Woodson, Cashmere, Monroe
133	.187	.023	0.59	1.33	2100	Some AP, M	Corn, wheat, clover, timothy	F	W. H. Spangler, Hallard, Monroe
137	.078	.014	0.28	1.21	2600	Comp fert yearly	Corn, wheat, clover	P	O. L. McNeil, Alderson, Monroe
141	.062	.019	0.24	1.07	2200	Some AP, M	Corn, grain, clover, grass	P	C. E. Saunders, Forest Hill, Summers
143	.054	.018	0.57	0.62	1500	Med amts AP, M	Corn, grain, clover	P	E. S. Saunders, Forest Hill, Summers
144	.090	.019	0.52	1.47	2200	Med amts AP	Wheat, oats, truck crops	P	W. C. Anderson, Jumping Branch, Summers
145	.092	.024	0.39	1.31	3500	AP on wheat	Buckwheat, wheat	P	I. B. McCommas, Jumping Branch, Summers
146	.103	.020	0.35	1.84	1600	Some AP, L, M	Buckwheat, clover, corn	F	A. H. Mann, Jumping Branch, Summers
147	.252	.060	1.23	3.63	4100	Med amts AP	Corn, soybeans, wheat, clover	F	O. A. Odell, Nettie, Nicholas
148	.134	.028	0.92	1.93	3900	None	Bluegrass, broomsedge	P	R. W. Sawyers, Canvas, Nicholas
150	.137	.025	0.67	2.11	2000	Some AP	Buckwheat, grass	P	A. C. Dasey, Mt. Lookout, Nicholas
151	.166	.046	1.23	2.06	3200	Some AP, M	Corn, grain, hay	F	A. Bryant, Summersville, Nicholas
153	.155	.042	1.71	2.21	4200	None	Wire grass, red top	F	D. T. Callahan, Craigsville, Nicholas
156	.154	.040	1.29	1.51	2700	Some AP, M	Soybeans, meadow, oats	F	T. Smith, Frew, Tyler
157	.112	.034	1.33	1.11	2000	Some AP, M	Corn, soybeans, clover, wheat	F	E. Archer, Middlebourne, Tyler
163	.105	.071	1.24	1.11	2100	None	Corn, weeds	P	Reynolds Memo. Hosp., Glendale, Marshall
166	.144	.084	0.84	1.44	3700	Some M	Corn, wheat, clover, grass	F	E. W. Dorsey, Moundsville, Marshall
169	.116	.076	0.83	1.14	2300	Some M	Grass, weeds	P	J. S. Supler, Triadelphia, Ohio
178	.141	.044	1.06	1.51	2300	None	Bluegrass pasture	F	Clark Leap, New Martinsville, Wetzel
185	.096	.023	1.08	1.03	3200	Heavy amounts M yrly	Corn, clover, grain	G	J. P. Harmon, St. Marys, Pleasants
195	.084	.024	0.76	0.67	3800	Some AP, M	Corn, wheat, grass	P	G. F. Mitchell, Franklin, Pendleton
196	.104	.035	1.41	0.48	2800	Some AP, M	Corn, wheat, grass	P	J. D. Trumbo, Franklin, Pendleton
215	.103	.024	2.36	0.65	3000	None	Corn mostly	P	Chas. Daily, Harpers' Ferry, Jefferson
219	.133	.024	1.93	0.70	0	Some M & comp fert	Corn, truck crops	P	E. Vanrensellaer, Berkeley Springs, Morgan
220	.101	.043	1.31	0.76	0	Some M & comp fert	Truck crops	P	H. Henry, Berkeley Springs, Morgan
222	.157	.034	1.26	1.38	1900	None	Peach orchard	P	Mrs. G. Allen, Berkeley Springs, Morgan
224	.095	.034	1.69	0.54	0	None	Wheat, orchard, grass, clover	P	J. W. Grove, Berkeley Springs, Morgan
225	.107	.026	1.46	0.60	0	Some L	Rye, weeds, grass	P	Wm. Grove, Berkeley Springs, Morgan
228	.145	.051	1.79	1.02	1900	None	Rye, corn	P	————, Cherry Run, Morgan
232	.153	.041	1.58	0.71	1400	Some AP, M	Corn, wheat, clover	F	G. Mathias, Mathias, Hardy
242	.128	.041	1.28	1.63	0	None	Pasture	F	A. Mason, Greenwood, Doddridge
248	.120	.034	1.28	1.28	4000	Some AP every 2 years	Corn, grain, grass	G	Dr. Floyd, Harrisville, Ritchie
249	.135	.039	1.15	1.43	3200	Med amts AP	Orchard, clover	F	J. D. Cunningham, Smithville, Ritchie
262	.089	.044	2.51	0.72	2800	None	Corn, soybeans, grain	P	————, Hurricane, Putnam
269	.101	.028	1.38	1.60	5800	None	Timberland, stony	P	Mrs. W. S. Edwards, Millikin, Kanawha
271	.210	.068	1.22	2.05	3000	None	Pasture	G	A. B. Huffman, Palestine, Wirt
273	.070	.015	1.40	1.14	5800	None	Bluegrass, vetch	P	Near Black Hill Church, Wirt
276	.117	.071	1.45	2.13	6000	None	Corn, grain	F	J. F. Lanon, Blueville, Taylor

277	.169	.068	1.52	2.04	1000	None
278	.256	.081	1.53	2.71	4000	None
279	.181	.072	1.43	2.49	4600	Heavy amts M
280	.161	.061	1.40	1.97	1000	Heavy AP, M, & med L
281	.151	.055	1.57	1.52	400	Med amts AP, L
282	.173	.079	1.55	1.70	5600	Med amts AP, L, M
284	.116	.036	1.31	1.19	7800	AP yearly
287	.224	.088	1.69	2.09	5200	Some AP
289	.159	.084	1.12	1.98	3200	AP every 3 years
290	.217	.061	1.35	2.62	8400	None
293	.099	.038	1.26	1.39	8000	Some AP
295	.148	.052	1.74	1.63	4800	None
295a	.160	.050	1.53	1.97	4200	None
297	.082	.032	1.47	1.04	8200	None
297a	.134	.037	1.20	2.13	8200	None
298	.214	.045	1.36	2.07	4600	None
298a	.128	.038	1.90	1.61	4600	None
307	.142	.063	1.74	1.67	7800	Med amts AP, L, M
308	.122	.049	1.22	1.48	4000	None
311	.178	.046	1.20	1.81	8800	Med amts AP, L, M
315	.153	.043	1.15	2.57	5800	Heavy amts M, AP
320	.143	.047	1.32	1.62	8000	Some AP, L
326	.129	.067	0.67	1.79	2800	Some AP
327	.075	.023	1.47	1.46	5400	Some AP
332	.122	.029	1.04	1.71	3400	None
332a	.056	.019	0.67	1.06	3400	None
335	.146	.046	1.38	2.20	4800	Some AP, L, M
335a	.116	.030	1.38	2.30	4800	None
337	.184	.038	1.71	3.02	4800	None
339	.174	.046	0.65	2.77	5400	AP every 2 yrs
342	.193	.055	1.34	2.41	4200	None
343	.159	.042	0.45	2.49	3600	None
346	.131	.050	1.31	1.44	800	None
349	.125	.052	0.77	1.23	0	Med amts AP, M, L
350	.093	.060	0.90	0.84	2800	Some AP, M
351	.108	.060	0.83	1.24	3000	Some AP, L, M
352	.092	.063	0.77	0.91	2600	None
355	.092	.051	1.09	0.96	3600	M, L once
356	.121	.059	0.90	1.28	4800	Some AP
357	.117	.072	1.15	1.19	4800	None
358	.141	.060	1.22	1.27	2200	Some M, L
359	.128	.060	1.42	1.26	3600	Some M, L
362	.231	.067	0.70	2.20	5000	None
363	.227	.081	0.45	2.36	200	M & L once
364	.136	.050	1.02	1.29	4800	Some M
366	.183	.047	0.77	1.70	2400	None
372	.195	.038	2.12	1.91	2600	None
374	.185	.048	0.30	3.13	0	None
375	.113	.042	0.70	1.17	2600	None
379	.096	.018	0.77	1.30	3200	None
385	.195	.037	1.28	2.33	2800	Med amts AP, L

Corn, grain	F	J. F. Lanon, Blueville, Taylor
Pasture	P	Mrs. B. F. Fleming, Grafton, Taylor
Truck crops	F	J. A. Thomas, Grafton, Taylor
Truck crops	F	S. R. Jenkins, Grafton, Taylor
Alfalfa, grass	F	S. R. Jenkins, Grafton, Taylor
Corn, grain, grass	F	I. M. Rinker, Grafton, Taylor
Corn, soybeans	F	A. M. Allender, Grafton, Taylor
Corn, pasture, meadow	P	Jake Zinn, Philippi, Barbour
Pasture	P	G. W. Gaul, Philippi, Barbour
Corn, wheat, clover	F	E. R. Dyer, Philippi, Barbour
Corn, oats, weeds, grass	P	R. B. Burner, Philippi, Barbour
Corn, wheat, clover	F	J. G. Vanscoy, Kerns, Randolph
Corn, wheat, clover	F	J. G. Vanscoy, Kerns, Randolph
Weeds, grass	P	Kirk Wees, Elkins, Randolph
Weeds, grass	P	Kirk Wees, Elkins, Randolph
Weeds, grass	P	D. O. Harper, Elkins, Randolph
Weeds, grass	P	D. O. Harper, Elkins, Randolph
Corn, wheat, clover	F	I. J. Ireland, Buckhannon, Upshur
Pasture, some clover	F	S. E. Marple, Buckhannon, Upshur
Corn, wheat, clover	F	P. G. Groves, Buckhannon, Upshur
Corn, wheat, clover	F	L. W. Pifer, Buckhannon, Upshur
Corn, grain	P	A. Starcher, Berlin, Lewis
Corn, grain, soybeans	P	J. B. McLaughlin, Strange Creek, Braxton
Corn, grain, soybeans	P	J. B. McLaughlin, Strange Creek, Braxton
Corn, wheat, clover	P	Adoms Bros., Flatwoods, Braxton
Weeds, grass	P	Adoms Bros., Flatwoods, Braxton
Corn, hay, wheat	P	L. D. Smith, Cowen, Webster
Briers, sedge	P	L. D. Smith, Cowen, Webster
Briers, sedge	P	L. B. Bobbitt, Cowen, Webster
Corn, oats, grass	P	Floyd Miller, Cowen, Webster
Corn, clover, bluegrass	P	W. H. Cunningham, Webster Sp'gs, Webster
Bluegrass, and clover pasture	F	W. H. Cunningham, Webster Sp'gs, Webster
Japan clover meadow	P	H. Conrad, Orlando, Braxton
Corn, grain, clover	F	N. F. Snowden, Chester, Hancock
Corn, wheat, meadow	F	Geo. Pepin, Chester, Hancock
Corn, oats, wheat	G	J. S. Stephens, Chester, Hancock
Meadow for several years	F	J. S. Stephens, Chester, Hancock
Corn, oats, wheat, clover	F	J. Krislinger, New Cumberland, Hancock
Corn, oats, hay	P	M. Headley, New Cumberland, Hancock
Not cultivated	—	Weirton Steel Co., Weirton, Hancock
Alfalfa for five years	F	H. F. Hindman, Hollidays Cove, Hancock
Corn, grain, meadow	F	E. M. Smith, Wellsburg, Brooke
Bluegrass pasture for years	P	W. L. McCleary, Warwood, Ohio
Millet, pasture	G	W. L. McCleary, Warwood, Ohio
Meadow for several years	F	Ohio County Farm, Roney's Point, Ohio
Corn, wheat, hay	F	J. D. Holswade, Spencer, Roane
Few weeds and sedge	*P	D. A. Arnold, Keyser, Mineral
Corn, wheat, clover	G	Russel Farm, Keyser, Mineral
Corn, wheat, clover	G	Russel Farm, Keyser, Mineral
Clover, grass pasture	F	H. Boggs, Ivydale, Clay
Rye, vetch, soybeans	P	I. N. Combs, Romney, Hampshire

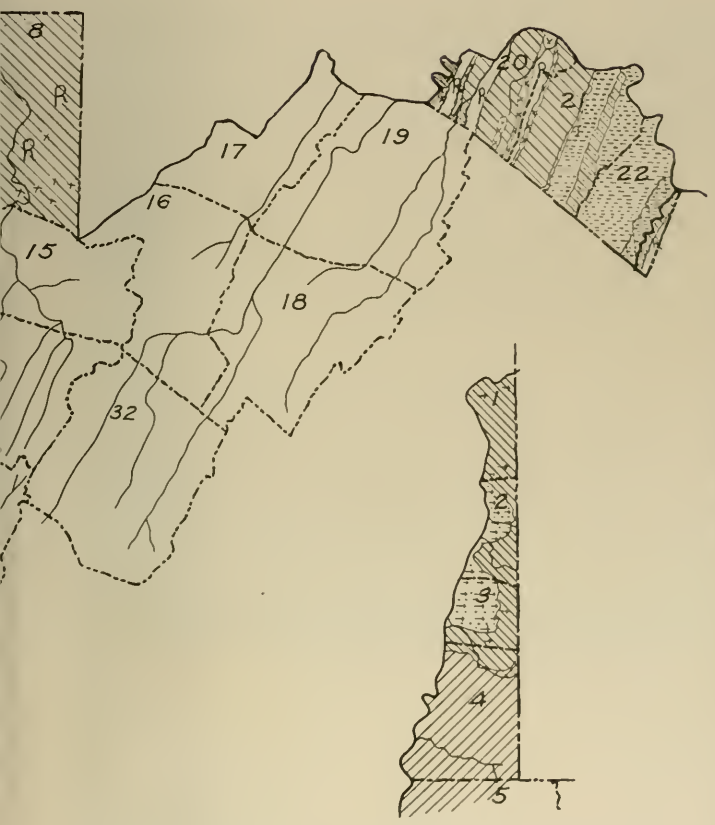
SOIL MAP OF

COMPILED FROM THE U. S. BUREAU



T VIRGINIA

L SURVEYS OF WEST VIRGINIA



COUNTIES

1—Hancock
2—Brooke
3—Ohio
4—Marshall
5—Wetzel
6—Marion
7—Monongalia
8—Preston
9—Pleasants
10—Tyler
11—Doddridge
12—Harrison
13—Taylor
14—Barbour
15—Tucker
16—Grant
17—Mineral
18—Hardy
19—Hampshire
20—Morgan
21—Berkeley
22—Jefferson
23—Wood
24—Ritchie
25—Jackson
26—Wirt
27—Calhoun
28—Gilmer
29—Lewis
30—Upshur
31—Randolph
32—Pendleton
33—Mason
34—Roane
35—Braxton
36—Cabell
37—Putnam
38—Kanawha
39—Clay
40—Webster
41—Wayne
42—Lincoln
43—Boone
44—Raleigh
45—Fayette
46—Nicholas
47—Greenbrier
48—Pocahontas
49—Mingo
50—Logan
51—Wyoming
52—McDowell
53—Mercer
54—Summers
55—Monroe

NOTE: No attempt has been made to show the extent of the River Flood Plain Soils. Reports have not yet been published for the unshaded counties. Reports for Tucker (15) and Grant (16), however, are on the press at this time. Field work has been completed for Mineral (17), and is being completed for Mercer (53), Summers (54), and Monroe (55). A preliminary geological survey has been made for Hardy (18) and Hampshire (19). The work on the four remaining counties is to be done shortly.

DEKALB SERIES (Concluded)

Soil No.	Percentage of N	P	K	C	Req'm't $CaCO_3$ Lbs. Per A	Kinds and Amounts of Fertilizer Used	Crops Generally Grown and Yield		Owner, Address, and County
386	.093	.032	0.64	1.24	2600	None	Corn, wheat	P	J. C. Hott, Romney, Hampshire
387	.119	.039	1.60	1.12	1000	None	Not cultivated	—	N. Augusta, Romney, Hampshire
390	.057	.022	0.77	0.40	4800	None	Not cultivated	—	————, Athens, Mercer
397	.123	.030	1.15	1.55	5000	None	Fair woodland	—	————, Sandlick, Mercer
409	.085	.033	1.74	1.34	3000	None	Not cultivated	—	W. F. Black, Myria, Lincoln
413	.158	.060	1.60	1.36	2400	None	Pasture	F	May Everette, Griffithsville, Lincoln
417	.172	.053	1.67	1.74	1600	None	Corn for several years	F	Tom Bias, Danesville, Boone
420	.095	.043	1.51	1.43	2600	None	Japan clover, pasture	F	————, Madison, Boone
421	.166	.061	0.26	1.64	1400	None	Japan clover, pasture	F	————, Greenview, Boone
434	.139	.033	0.83	1.95	2400	None	Pasture	F	R. F. Armentrout, Parsons, Tucker
437	.294	.069	0.57	4.06	5200	None	Bluegrass pasture	P	Sugar Land Farm, Ben Bush, Tucker
438	.301	.041	0.85	4.77	5200	None	Fair cut-over land	—	Davis Coal Co., Thomas, Tucker
439	.135	.019	0.57	2.65	4400	None	Fair cut-over land	—	Davis Coal Co., Thomas, Tucker
441	.163	.053	0.64	2.50	2400	Some M	Oats, buckwheat, clover	P	D. Aarhalt, Mt. Storm, Grant
442	.185	.048	1.02	2.27	3600	None	Hay, meadow	F	Parker Bros., Mt. Storm, Grant
443	.243	.070	1.22	2.87	5400	None	Grass	P	J. W. & L. M. Lee, Gormania, Grant
449	.156	.047	1.41	1.75	2800	None	Wheat, corn, soybeans	P	C. Wade, Mt. Morris, Pa., Monongalia
450	.163	.040	0.90	1.81	2400	Some AP	Wheat, grass	P	C. A. Reed, Glenville, Gilmer
455	.134	.034	1.02	1.49	1800	AP once	Corn, wheat, clover, timothy	F	C. L. Reed, Glennville, Gilmer
456	.128	.044	1.22	1.30	3400	AP every year	Corn, soybeans, wheat	P	R. E. Davis, Dekalb, Gilmer
462	.123	.032	1.09	1.87	3200	None	Clover, bluegrass	P	H. S. Knight, Big Ben, Calhoun
466	.092	.025	0.83	1.31	2000	Some M	Oats, corn, meadow	F	F. W. Pringle, Ripley, Jackson
467	.038	.040	0.83	1.79	3800	Some M	Wheat, corn, grass	P	J. M. Bailey, Mt. Hope, Raleigh
468	.107	.028	0.77	1.48	3000	None	Corn, meadow	*P	P. Bailey, Prosperity, Raleigh
469	.123	.032	0.90	1.71	3000	None	Fallow land, barren	P	Raleigh Coal Co., Raleigh, Raleigh
470	.114	.032	.070	2.41	3800	None	Corn, grass	P	D. R. Lilley, Ghent, Raleigh
472	.131	.034	0.77	1.75	3000	Med amts M	Meadow, some clover & timothy	F	Raleigh Co. Farm, Daniels, Raleigh
473	.128	.035	0.45	1.71	3200	Med amts M	Corn, buckwheat	F	Lewis Heirs, Daniels, Raleigh
474	.140	.047	1.15	1.66	4000	None	Meadow	P	G. P. Daniels, Daniels, Raleigh
477	.079	.021	0.45	1.03	2200	None	Pasture, weeds	P	Pocahontas Fuel Co., Pineville, Wyoming
478	.129	.036	1.09	1.81	2600	Med amts AP, M	Meadow, corn	F	O. F. Brooks, Rockview, Wyoming
480	.128	.047	1.15	1.66	2600	Some AP	Pasture	P	R. S. Collins, Baileysville, Wyoming
483	.131	.041	1.28	1.71	3800	None	Corn, oats, meadow	P	H. C. Presley, Gary, Wyoming
485	.151	.040	1.09	1.71	3800	None	Timberland (Fair)		Forest Reserve, Crumpler, McDowell
Ave.	.136	.043	1.12	1.65	3300				

MEIGS SERIES

4	.068	.029	1.34	0.96	4400	None	Corn, corn, grass	F Mr. Wilson, Ona, Cabell
118	.116	.035	0.75	1.08	3100	Med amts M & 4-10-4	Corn, wheat, clover, timothy	F J. A. Young, Marlinton, Pocahontas
155	.121	.032	1.63	1.39	3800	Some M	Corn, corn, corn	P J. W. Smith, Frew, Tyler
175	.115	.049	0.86	1.20	2500	None	Corn, wheat, clover	F T. H. Cornett, Steelton, Wetzel
184	.190	.052	1.56	1.89	1300	None	Bluegrass pasture	G G. K. Ruttencutter, St. Marys, Pleasants
250	.146	.039	1.41	1.56	5200	None	Meadow	P J. F. Hartly, Burnt House, Ritchie
251	.117	.041	1.58	1.19	2200	None	Bluegrass pasture	F Geo. Hardman, Fonzo, Ritchie
257	.145	.063	1.95	1.42	3000	None	Oats, clover, pasture	F D. H. Thomas, Red House, Putnam
272	.142	.048	1.38	1.51	4200	None	Bluegrass pasture	F A. B. Huffman, Palestine, Wirt
286	.173	.057	1.20	2.21	4600	Some AP, L	Corn, soybeans, wheat	F R. D. Talbott, Philippi, Barbour
303	.165	.033	1.57	1.73	0	None	Weeds, grass	P M. Moore, Mingo, Randolph
324	.136	.060	1.24	1.40	4400	None	Bluegrass and clover pasture	F Jim Evans, Reeds Station, Lewis
393	.071	.017	0.30	1.01	2000	None	Oats, grass	P ————, Gardner, Mercer
395	.130	.047	1.73	1.26	3000	AP occasionally	Corn, wheat, clover	P Tom Bowling, Spanishburg, Mercer
402	.147	.062	0.64	1.50	1400	None	Wild grass pasture	F Wm. Ferguson, Kenova, Wayne
403	.076	.046	0.77	0.60	1800	None	Wild grass pasture	P Wm. Purdue, Ceredo, Wayne
404	.227	.048	2.26	1.88	3400	None	Pasture, some clover	P U. Rowe, Ceredo, Wayne
405	.073	.023	1.09	0.68	2000	None	Pasture (sandy)	F T. E. McQuin, Kenova, Wayne
407	.108	.034	1.51	0.86	5200	None	Japan clover pasture	F W. A. Carroll, Hamlin, Lincoln
425	.117	.085	1.15	1.18	4200	Med amts M, AP, L	Corn, wheat, hay	F R. Shepherd, Spencer, Roane
445	.183	.071	1.47	1.88	2200.	None	Poverty grass, hay	P S. Tennant, Pentress, Monongalia
446	.126	.034	1.28	1.24	3800	None	Meadow, pasture	P S. Tennant, Pentress, Monongalia
454	.094	.027	0.90	1.42	4000	None	Meadow with some clover	P Bush Heirs, Glenville, Gilmer
457	.095	.027	1.28	1.45	3200	None	Pasture (Japan clover only)	F E. L. Ash, Latonia, Gilmer
458	.144	.028	0.57	1.47	2800	M occasionally	Corn, wheat, oats, grass	P M. H. Knight, Cherry Creek, Calhoun
459	.122	.041	1.28	1.39	2400	None	Pasture	P R. R. Low, Grantsville, Calhoun
Ave.	.128	.043	1.25	1.36	3100			

UPSHUR SERIES

8	.127	.047	1.88	1.29	5200	None	Orchard, clover	F J. A. Creel, Davisville, Wood
18	.124	.061	2.49	1.08	0	None	Orchard, clover	F Mr. Clark, Ona, Cabell
56	.087	.027	1.04	1.05	2600	None	Pasture, briers, bluegrass	F M. E. Morgan, Ravenswood, Jackson
59	.103	.031	1.82	0.92	6400	M & AP once	Grass, underbrush, clover	*P J. F. Dean, Parkersburg, Wood
60	.140	.036	1.72	1.34	5000	Comp fert once	Corn, wheat, pasture	G J. T. Lowther, Pullman, Ritchie
71	.149	.038	1.28	1.86	0	Some AP, L, M	Corn, oats, timothy, clover	F T. B. Taylor, Terra Alta, Preston
82	.088	.021	1.95	1.04	3800	None	Corn, wheat, timothy	F Jer. Plants, Ambrosia, Mason
112	.205	.062	2.48	1.61	1600	Med amts AP, M, L	Alfalfa, cowpeas, clover	G W. D. Zinn, Philippi, Barbour
123	.098	.037	1.57	0.96	2200	AP occasionally	Corn, wheat, clover	P C. A. Jackson, Lewisburg, Greenbrier
126	.096	.033	1.73	1.14	2300	Some AP	Corn, wheat, clover, grass	F J. D. Sites, Vago, Greenbrier
132	.112	.047	1.60	1.32	1200	Some M, AP	Corn, wheat, timothy, clover	G E. W. Woodson, Cashmere, Monroe
158	.109	.031	1.26	1.16	1400	None	Weeds, wild grass	P A. Thomas, Middlebourne, Tyler
180	.110	.047	1.50	1.43	2100	None	Potatoes, clover, buckwheat	F E. R. Smith, St. Marys, Pleasants
229	.077	.032	1.50	0.41	0	None	Corn, orchard	F Sleepy Cr. Or. Co., Berkeley Springs, Morgan
241	.324	.100	1.87	3.14	400	None	Bluegrass pasture	G L. Maxwell, Grove, Doddridge
247	.161	.060	1.85	1.94	6000	Med amts M, AP	Corn, soybeans, clover	G E. E. Cokeley, Harrisville, Ritchie
258	.070	.072	2.43	0.47	6000	None	Japan, white clover pasture	F B. A. Brown, Red House, Putnam
274	.108	.039	1.26	1.19	8400	None	Bluegrass pasture	F D. Shepherd, Elizabeth, Wirt

UPSHUR SERIES (Continued)

Soil No.	Percentage of Elements N	P	K	C	Req'm't $CaCO_3$ Lbs. Per A.	Kinds and Amounts of Fertilizer Used	Crops Generally Grown and Yield		Owner, Address, and County
304	.214	.046	1.66	2.28	7800	None	(Rocky soil) weeds	P	C. A. Scott, Mingo, Randolph
306	.222	.048	0.97	2.52	8000	M & AP occasionally	Corn, wheat, clover	G	Chas. Betts, Lorentz, Upshur
318	.247	.088	1.67	2.37	5200	None	White clover, bluegrass	F	W. B. Lawson, Berlin, Lewis
323	.193	.064	1.37	1.88	4200	AP & L occasionally	Corn, grass, weeds	F	Jim Evans, Reeds Station, Lewis
324	.136	.060	1.24	1.40	4400	AP & L occaslonally	Corn, grass, weeds	F	Jim Evans, Reeds Station, Lewis
328	.112	.044	1.28	1.20	2800	None	Weeds, grass	F	Mr. Floyd, ————, Braxton
329	.142	.041	1.06	1.82	2400	Med amts AP, M, L	Corn, cowpeas, grain, clover	F	J. C. Shaver, Heaters, Braxton
333	.108	.047	1.39	1.24	4200	Some AP, L	Wheat, clover, bluegrass	F	E. Morrison, Flatwoods, Braxton
345	.154	.052	0.90	1.76	2800	None	Wheat, clover, grass, corn	F	J. Woodzell, Webster Springs, Webster
347	.232	.052	1.86	2.39	2800	None	Pasture, meadow, bluegrass	F	H. Conrad, Orlando, Braxton
369	.162	.027	1.67	1.39	1000	None	Corn, clover, grain, weeds	P	Harry Boggs, Ivydale, Clay
373	.243	.064	1.41	3.06	400	None	Apple orchard	G	Knobly Mt. Orchard, Keyser, Mineral
388	.066	.019	1.28	0.58	1000	Some M, AP	Corn, soybeans, wheat, clover	P	G. W. Smith, Romney, Hampshire
389	.140	.033	0.64	1.37	2200	None	Weeds, wild grass	P	J. B. Rannells, Romney, Hampshire
426	.100	.041	1.28	1.08	3600	Med amts AP, M	Corn, wheat, clover, weeds	F	W. L. Lowe, Spencer, Roane
435	.208	.048	0.96	2.59	1600	M once 10 yrs ago	Wheat, oats, clover, timothy	P	J. B. Helmick, Ben Bush, Tucker
436	.260	.052	1.02	3.27	3400	None	Not cultivated	—	W. Jennings, Ben Bush, Tucker
453	.118	.053	0.83	1.20	3400	None	Clover and grass pasture	F	Fred Lewis, Glenville, Gilmer
461	.127	.046	1.60	1.33	2800	None	Bluegrass pasture	F	H. S. Knight, Big Bend, Calhoun
464	.117	.029	1.02	1.77	3200	None	Bluegrass pasture	G	Mrs. J. Strum, Arnoldsburg, Calhoun
481	.122	.033	1.28	1.17	2200	None	Pasture, some bluegrass	F	Thos. Harman, Anawalt, McDowell
Ave.	.146	.046	1.48	1.56	3100				

WESTMORELAND SERIES

1	.146	.061	2.12	1.56	2800	None	Bluegrass, clover	F	Fred Whitman, Adamston, Harrison
14	.161	.059	1.25	1.71	3000	Med amts M, AP	Corn, oats, clover, potatoes	G	F. B. Haller, Rosemont, Taylor
23	.341	.081	1.54	3.86	2000	Unknown	Potatoes, clover, pasture	F	G. C. Sturgiss, Morgantown, Monongalia
69	.237	.107	1.50	2.46	1400	Some M, AP, L	Corn, oats, wheat, hay	G	J. F. Copeman, Kingwood, Preston
81	.137	.051	1.78	1.72	2400	None	Corn, oats, clover, bluegrass	G	Marion Co. Farm, Fairmont, Marion
89	.203	.076	1.74	2.00	2000	None	Corn, oats, clover	G	J. S. Nuzum, Colfax, Marion
90	.209	.062	1.37	2.19	3200	M, AP & L once	Corn, clover, soybeans, pasture	G	W. D. Zinn, Philippi, Barbour
167	.147	.091	0.78	1.26	2500	Med amts AP & heavy M	Corn, oats, wheat, alfalfa	G	M. B. Pierce & Son, Moundsville, Marshall
179	.181	.103	1.46	1.81	1700	None	Bluegrass pasture	G	R. M. Whitman, New Martinsville, Wetzel
187	.158	.057	1.91	1.56	0	None	Bluegrass, clover, pasture	G	Pleasants Co. Farm, Melmont, Pleasants
285	.220	.062	1.53	2.00	5200	Some M, AP	Corn, wheat, clover, grass	F	T. L. Burner, Philippi, Barbour
Ave.	.194	.073	1.54	2.01	2300				

RIVER FLOOD PLAINS PROVINCE

Second Bottom

ELK SERIES

15	.184	.061	1.10	2.02	3400	None	Meadow	F	M. G. Lawson, Flemington, Taylor
95	.164	.049	1.15	1.81	0	Some M, AP, L	Corn, bluegrass, alfalfa	G	J. F. Philips, Fairmont, Marion
98	.126	.035	0.89	1.28	2000	Med amts M, AP, L	Corn, wheat, grass	F	A. Sheets, Lost Creek, Harrison
99	.137	.042	1.16	1.34	2000	None	Red top weeds, briers	P	W. F. Boyers, Fairmont, Marion
106	.163	.068	1.19	1.48	200	None	Weeds, grass	F	R. E. L. Stout, Bridgeport, Harrison
124	.080	.019	0.51	1.24	2300	AP once	Corn, wheat, timothy, clover	P	C. A. Jackson, Lewisburg, Greenbrier
Ave.	.142	.045	1.00	1.53	1600				

HOLSTON SERIES

12	.114	.040	1.06	1.31	1200	None	Corn, hay, grass	*P	W. J. Smith, Centerville, Wayne
13	.169	.057	1.68	1.71	3400	Some AP	Meadow	*P	W. F. Plymale, Centerville, Wayne
21	.076	.041	0.88	0.76	1400	None	Tobacco, grain, hay	*P	Mr. Sias, Ona, Cabell
43	.166	.076	1.86	1.60	3200	Some M	Corn, wheat, timothy	F	E. C. Crane, Poca, Kanawha
55	.108	.037	0.99	1.14	0	Med amts M, AP	Corn, timothy, cowpeas	G	I. Sturkey, Ravenswood, Jackson
57	.056	.018	1.07	0.83	2800	M, AP occasionally	Corn, wheat, clover, timothy	F	M. E. Morgan, Ravenswood, Jackson
75	.217	.059	1.77	3.14	0	Some M & comp fert	Corn, tobacco, wheat	G	J. H. Moore, Milton, Cabell
76	.081	.032	1.16	0.77	1600	M once	Corn, oats, wheat, timothy	P	L. T. Kincade, Pt. Pleasants, Mason
84	.088	.018	0.72	1.01	2200	M once	Corn, wheat, timothy	F	(Near) J. White, Culloden, Cabell
110	.094	.036	0.50	0.90	2000	None	Corn, wheat, timothy, watermelons	F	Geo. Johnson, Charleston, Kanawha
113	.162	.040	1.49	1.73	1800	Some M, AP	Corn, briers, weeds	P	J. E. Colman, West Union, Doddridge
243	.148	.050	1.23	1.58	8400	None	Pasture (weedy)	P	F. Smith, West Union, Doddridge
259	.127	.040	1.18	1.36	2000	None	Bare soil	*P	————, Mt. Vernon, Putnam
264	.120	.040	1.65	1.28	5400	None	Meadow, weeds	*P	W. B. Waldon, St. Albans, Kanawha
265	.112	.105	1.43	1.54	3000	None	Corn every year	F	E. Workman, St. Albans, Kanawha
316	.129	.053	1.08	1.45	7400	M regularly	Garden, truck crops	F	S. Buchannon, Buckhannon, Upshur
317	.184	.061	0.73	2.15	4400	None	Not cultivated	—	Ed. Swisher, Berlin, Lewis
317a	.131	.056	0.88	1.54	400	None	Not cultivated	—	Ed. Swisher, Berlin, Lewis
325	.193	.060	1.31	1.34	2800	Med amts M, AP, L	Corn, soybeans, wheat, hay	F	J. B. McLaughlin, Strange Creek, Braxton
368	.117	.057	1.28	1.74	3400	None	Woodland	F	A. Stephenson, Clay, Clay
380	.185	.037	1.28	2.88	0	Med amts M, AP, L	Corn, wheat, clover	F	Harry Boggs, Ivydale, Clay
396	.100	.026	0.12	1.23	1000	None	Hay, grass	F	Mrs. J. C. Hollilway, Rock, Mercer
400	.070	.019	0.64	0.88	3400	Some M, L	Corn, clover, grain	F	Mrs. H. Hatter, Kenova, Wayne
401	.103	.052	1.15	0.86	2000	None	Corn, oats, hay	*P	C. A. Hatter, Kenova, Wayne
411	.096	.052	0.59	0.94	3000	Some M, AP	Corn, wheat, hay	P	County Farm, Hamlin, Lincoln
406	.116	.052	1.09	1.04	3200	Med amts M, AP, L	Corn, wheat, clover	G	W. W. McComas, Wayne, Wayne
415	.117	.061	0.98	1.12	3600	None	Corn, wheat, hay	*P	L. J. Vance, W. Hamlin, Lincoln
418	.125	.046	1.47	1.07	1800	None	Meadow	*F	————, Danville, Boone
419	.108	.047	0.96	1.22	4000	None	Corn, hay, weeds	F	————, Uneeda, Boone
422	.165	.061	1.02	1.28	4000	None	Corn, grain, grass	*P	————, Greenview, Boone
432	.121	.034	0.57	2.27	2600	Med amts M, AP, L	Corn, oats, clover	F	H. C. Long, Parsons, Tucker
433	.205	.051	0.78	2.77	5000	Med amts M & AP	Clover, corn, potatoes, oats	F	H. C. Long, Parsons, Tucker
447	.148	.050	0.83	1.39	3600	None	Poverty grass, sedge	P	J. T. Tennant, Pentress, Monongalia

HOLSTON SERIES (Continued)

Soil No.	Percentage of Elements N	P	K	C	Req'mt $CaCO_3$ Lbs. Per A.	Kinds and Amounts of Fertilizer Used	Crops Generally Grown and Yield		Owner, Address, and County
451	.142	.054	1.02	1.53	3200	AP once	Grass, hay, soybeans	P	F. Kinderberger, Glenville, Gilmer
476	.054	.025	0.40	0.77	800	AP occasionally	Corn, millet, weeds	P	Pocahontas Coal Co., Pineville, Wyoming
479	.229	.079	1.28	2.56	2600	None	Pasture, wild grass	F	Newberry Heirs, Oceana, Wyoming
Ave.	.129	.047	1.06	1.36	2800				

TYLER SERIES

7	.134	.058	1.26	1.37	3400	Some M	Hay, corn, oats, wheat	F	Mr. Creel, Davisville, Wood
77	.195	.055	1.74	2.06	5200	None	Corn, oats, grass	*P	————, Davisville, Wood
85	.161	.042	0.93	1.77	1800	Heavy amts M, AP, L	Corn, meadow, clover	G	W. D. Zinn, Philippi, Barbour
159	.157	.032	1.04	1.67	700	None	Corn, grass, hay	P	B. F. Kile, Next, Tyler
177	.122	.038	1.06	1.18	2300	None	Briers, sedge, weeds	F	Wise Estate, New Martinsville, Wetzel
183	.117	.033	1.00	1.20	2100	Some M	Corn, grass, hay	P	G. K. Ruttencutter, St. Marys, Pleasants
246	.138	.047	1.10	1.42	3200	None	Corn, wheat, clover	*P	Mrs. S. P. Dyer, Harrisville, Ritchie
255	.190	.072	1.92	1.88	4200	None	Corn every year	G	L. E. Hartley, Red House, Putnam
256	.093	.044	1.20	0.96	3400	M occasionally	Corn, oats, truck crops	*P	L. E. Hartley, Red House, Putnam
260	.104	.033	1.51	1.00	2600	M, AP occasionally	Corn, wheat, meadow	*P	C. S. Handley, Teays, Putnam
275	.140	.035	1.33	1.38	6600	None	Bluegrass for 30 years	*F	C. R. Hansman, Elizabeth, Wirt
392	.163	.025	0.70	1.48	3800	None	Marsh grass	*P	Lilly Land Co., Princeton, Mercer
408	.080	.046	0.45	0.71	2600	M occasionally	Corn, soybeans, hay	P	L. R. Sweetland, Hamlin, Lincoln
428	.141	.082	1.02	1.44	4800	None	Meadow	F	Spencer suburb, Spencer, Roane
448	.148	.050	1.02	1.53	3600	M occasionally	Corn, oats, clover	*F	L. R. Shriver, Mt. Morris, Pa., Monongalia
463	.117	.051	0.96	1.10	1800	M occasionally	Corn every year	F	Matt Wyatt, Grantsville, Calhoun
Ave.	.137	.046	1.14	1.38	3200				

WHEELING SERIES

6	.171	.112	1.15	1.92	3000	Some M, AP	Meadow, some clover	G	J. B. Kester, Belmont, Pleasants
79	.091	.044	1.28	0.89	2000	Some M, L	Wheat, corn, timothy, grass	G	Ed Kyle, Cox's Landing, Cabell
83	.189	.181	1.17	1.58	0	Heavy amts M	General crops	G	W. A. Proctor, Ravenswood, Jackson
94	.174	.078	1.31	1.57	1400	Some M	Corn, wheat, timothy	G	Dr. Keefer, Belleville, Wood
111	.097	.077	1.08	1.07	3600	None	Wheat, wheat, wheat	P	————, Follansbee, Brooke
160	.175	.102	1.25	1.75	700	Med amts AP, M	Corn, clover, alfalfa	G	J. R. Wells, Bens Run, Tyler
162	.145	.173	0.75	1.73	1500	Some M	Clover, corn, grain	F	Reynolds Memo. Hosp. Glendale, Marshall
165	.190	.105	0.83	2.01	2800	M every 3 years	Corn, wheat, timothy	G	Thos. Scott, Moundsville, Marshall
173	.220	.159	0.78	2.70	4000	None	Corn, grass	F	A. F. Cochran, New Martinsville, Wetzel
174	.121	.077	0.94	1.25	3000	None	Corn, soybeans, grain	F	J. D. Morgan, Steelton, Wetzel
181	.072	.084	0.78	0.76	2100	M once	Corn, wheat, clover	G	G. W. Bills, Billsville, Pleasants
186	.161	.105	1.26	1.79	1700	Some AP	Meadow, corn	G	County Farm, Belmont, Pleasants
353	.143	.059	1.71	1.94	2600	Some AP, L	Corn, clover, oats, wheat	G	J. G. Watson, New Cumberland, Hancock
Ave.	.149	.104	1.10	1.61	2100				

First Bottom
HUNTINGTON SERIES

—	.213	.080	1.62	2.87	2400	None	Meadow, clover ..... G	G. Smith, Flemington, Taylor
46	.295	.122	1.90	3.35	3000	None	Corn, oats, timothy, clover ..... G	R. Underwood, Wellsburg, Brooke
49	.101	.043	0.95	2.74	0	None	Corn, corn, watermelons ..... G	W. C. Scott, Sherman, Jackson
50	.099	.052	1.21	1.82	0	None	Corn, corn ..... G	W. C. Scott & Adams, Sherman, Jackson
62	.077	.039	0.92	0.71	800	None	Corn, wheat ..... G	J. W. Miller, Mineral Wells, Wood
63	.136	.072	0.71	1.68	800	Some M, AP	Corn, wheat ..... G	E. J. Humphry, Belleville, Wood
73	.058	.046	1.71	0.82	2400	None	Corn, grass ..... G	H. T. Butcher, Mineral Wells, Wood
80	.148	.077	1.13	1.50	2200	AP, L, M, occasionally	Corn, wheat, timothy ..... G	I. Z. Swisher, Pt. Pleasants, Mason
86	.192	.056	1.37	2.07	3800	None	Old meadow ..... *P	M. Meredith, Fairmont, Marion
88	.216	.062	1.25	2.16	1800	Some AP, M	Corn, oats, meadow ..... G	L. D. Blake, Lost Creek, Harrison
100	.291	.068	1.37	3.12	3600	None	Grasses, some clover ..... F	Jackson Arnold, Lost Creek, Harrison
101	.320	.092	1.61	2.56	2200	None	Corn ..... G	A. J. Lodge, ————, Harrison
103	.252	.077	1.40	2.42	1200	None	Grasses, pasture ..... F	A. A. Long Bros., Bridgeport, Harrison
154	.171	.065	2.06	1.64	4000	Some AP	Corn, clover, soybeans ..... G	Tyler Co. Farm, Middlebourne, Tyler
161	.182	.069	1.39	3.95	800	None	Corn, corn, clover ..... G	Chas. Kull, Moundsville, Marshall
164	.136	.054	0.85	3.18	0	None	Corn, wheat, sweet clover ..... G	Thos. Scott, Moundsville, Marshall
168	.228	.108	0.72	3.93	300	Some AP, L	Potatoes, alfalfa ..... G	P. Burkle, Wheeling, Ohio
170	.164	.105	0.87	1.81	1900	None	Corn ..... G	————, Elm Grove, Ohio
176	.120	.081	0.93	3.46	0	Some M	Corn, clover ..... G	E. M. Williams, New Martinsville, Wetzel
182	.128	.060	1.30	1.41	2300	None	Corn, meadow ..... G	J. W. Bills, St. Marys, Pleasants
244	.123	.033	1.50	1.17	3000	None	Bluegrass meadow ..... F	W. M. Hammond, Mole Hill, Ritchie
245	.127	.047	1.60	1.27	4200	AP yearly	Corn, clover ..... *F	Mrs. R. B. Cokeley, Harrisville, Ritchie
252	.132	.052	1.46	1.33	5400	None	Meadow, no clover ..... G	Irving Ingram, Elizabeth, Wirt
261	.116	.038	1.55	1.27	1200	None	Corn, clover ..... G	T. N. Erskine, Teays, Putnam
263	.122	.063	1.67	1.25	400	None	Corn for several years ..... G	Allen Workman, St. Albans, Kanawha
268	.156	.049	1.66	2.00	1800	None	Millet, grass ..... F	Mrs. W. S. Edwards, Millikin, Kanawha
288	.240	.074	1.68	2.64	6000	AP yearly	Corn every year ..... G	D. Dickinson, Philippi, Barbour
299	.153	.079	1.56	2.35	4000	None	Iron, rag weeds ..... F	W. J. Strader, Beverly, Randolph
299a	.266	.079	1.53	2.62	4000	None	Unknown ..... —	W. J. Strader, Beverly, Randolph
301	.199	.052	1.25	1.80	4800	Some M, AP	Corn, clover, wheat, timothy ..... G	E. H. Crouch, Huttonsville, Randolph
301a	.169	.035	1.01	1.47	4800	Some M, AP	Corn, clover, wheat, timothy ..... G	E. H. Crouch, Huttonsville, Randolph
354	.171	.064	0.64	2.46	2600	Some AP, M, L	Corn, oats, wheat, meadow ..... G	Hudson Heirs, New Cumberland, Hancock
367	.196	.048	1.35	2.24	2600	M occasionally	Corn every year ..... F	A. Stephenson, Clay, Clay
376	.136	.058	1.28	1.61	2000	Med amts M, AP, L	Corn, wheat, timothy, clover ..... G	S. L. Dodd, N. Mountain, Berkeley
377	.143	.055	1.15	1.65	1800	Med amts M, AP, L	Corn, wheat, timothy, clover ..... G	S. L. Dodd, N. Mountain, Berkeley
378	.117	.070	0.90	1.33	400	Med amts M, AP, L	Corn, wheat, timothy, clover ..... G	S. L. Dodd, N. Mountain, Berkeley
394	.172	.039	1.73	1.91	0	AP every 2 years	Corn, wheat, clover ..... G	Tom Bowling, Spanishburg, Mercer
399	.199	.050	1.92	4.56	600	None	Corn, every year ..... G	Mrs. J. W. Hatters, Kenova, Wayne
410	.063	.033	1.02	0.55	800	Small amts M, L	Corn, clover ..... P	W. T. Black, Myrla, Lincoln
412	.133	.056	1.41	1.37	4400	Small amts M, L	Corn, wheat, hay ..... F	County Farm, Hamlin, Lincoln
414	.104	.050	0.90	0.97	3000	None	Orchard ..... F	H. W. Miller, Griffithsville, Lincoln
416	.168	.070	1.60	1.62	3200	None	Corn every year ..... P	Ben Polly Farm, Danville, Boone
424	.133	.062	0.70	1.19	2800	Med amts M, AP	Corn, wheat, hay ..... F	R. D. Hersman, Spencer, Roane
429	.249	.084	1.47	3.01	1600	Some AP	Corn, oats, grass ..... *F	A. D. Adams, Etam, Preston
431	.203	.072	1.15	2.13	3000	Med amts M, AP, L	Clover, potatoes, corn, oats ..... F	C. M. Jones, Parsons, Tucker
444	.193	.065	1.02	2.86	3000	Small amts M, AP	Corn, oats, hay ..... F	E. L. Crim, Gormania, Grant
460	.172	.052	1.09	1.90	2400	M occasionally	Meadow ..... *P	Wolverton Heirs, Grantsville, Calhoun

HUNTINGTON SERIES (Continued)

Soil No.	Percentage of Elements N	P	K	C	Req'm't $CaCO_3$ Lbs. Per A.	Kinds and Amounts of Fertilizer Used	Crops Generally Grown and Yield		Owner, Address, and County
465	.190	.089	0.83	1.96	2200	None	Meadow, corn	G	F. L. Hays, Arnoldsburg, Calboun
471	.335	.052	0.96	4.03	5400	None	Meadow	*P	C. R. Lilly, Ghent, Raleigh
475	.132	.045	1.02	1.78	3400	None	Meadow	G	Bill Brewer, McCraw, Wyoming
482	.062	.027	0.51	0.84	2400	M every 2 years	Corn, mostly	P	Pocahontas Fuel Co., Pageton, Wyoming
Ave.	.169	.062	1.26	2.08	2400				

MOSHANNON SERIES

51	.107	.052	1.08	1.13	2400	None	Corn, wheat, clover, timothy	G	Virgil Bowser, Crow Summit, Jackson
53	.083	.044	1.25	0.84	2600	None	Corn, grass	F	F. A. Morgan, Ravenswood, Jackson
54	.107	.048	1.21	1.19	1400	None	Corn, clover, grass	F	F. A. Morgan, Ravenswood, Jackson
78	.165	.036	1.95	1.58	5200	None	Corn, grain, timothy	F	John McCausland, Buffalo, Mason
96	.172	.061	1.63	1.52	3800	Some M, AP, L	Corn, oats, grass	G	L. N. Beatty, Mannington, Marion
102	.121	.043	1.24	1.02	1800	Some M, AP	Corn, wheat, timothy, clover	F	Cnas. Kalt, Crow Summit, Jackson
116	.171	.051	1.23	1.82	2700	Some M, AP	Corn, wheat, clover	F	J. S. McNeal, Hillsboro, Pocahontas
194	.292	.100	1.44	1.69	0	Some M, AP, L	Corn, wheat, grass	G	H. Anderson, Franklin, Pendleton
253	.149	.058	1.25	1.62	1800	None	Meadow	*F	L. E. Fluharty, Elizabeth, Wirt
254	.115	.049	1.26	1.26	3600	None	Meadow	F	C. E. McCoy, Elizabeth, Wirt
305	.211	.043	1.06	2.68	7600	Some M, AP	Corn, wheat, clover, grass	G	E. Smith, Buckhannon, Upshur
312	.157	.059	1.23	1.81	0	Some M, AP	Corn, hay	G	R. S. Reger, Buckhannon, Upshur
313	.175	.057	1.28	1.95	6200	Some M, L	Corn, hay, clover	G	W. H. Young, Buckhannon, Upshur
319	.167	.063	1.60	1.66	8000	None	Bluegrass meadow	F	————, Berlin, Lewis
322	.168	.042	1.00	1.96	4800	AP, L once	Corn, corn	F	Geo. White, Freemansburg, Lewis
331	.196	.057	1.37	1.97	4600	None	Unknown	—	J. C. Shaver, Heaters, Braxton
344	.145	.051	1.02	1.66	2800	None	Bluegrass pasture	F	C. Hoover, Webster Springs, Webster
348	.111	.061	1.03	1.03	600	Some M	Meadow	*F	N. G. Moore, Orlando, Gilmer
370	.113	.041	0.83	1.06	0	Med amts M, AP, L	Corn, wheat, clover	G	W. A. Leatherman, Keyser, Mineral
427	.111	.062	1.41	1.30	0	Some M, L	Truck crops	F	State Hospital, Spencer, Roane
430	.220	.074	1.35	2.19	2400	Some M, AP	Corn, grain, timothy, clover	G	J. W. Minear, St. George, Tucker
452	.137	.056	1.35	1.76	3000	Med amts AP, M	Corn, wheat, meadow	F	Floyd Bell, Glenville, Gilmer
Ave.	.154	.055	1.27	1.57	3000				

RIVER FLOOD PLAINS PROVINCE

First Bottom

POPE SERIES

292	.216	.052	1.37	2.54	7200	Med amts M, AP	Corn, clover	F	R. S. C. Green, Philippi, Barbour
309	.155	.034	1.14	2.08	10000	None	Sage grass, weeds	P	R. G. Smith, Rock Cave, Upshur
314	.265	.076	1.33	3.24	9600	Some L	Corn, hay, clover	G	H. Carper, Buckhannon, Upsbur
330	.164	.081	0.75	1.84	3600	None	Not cultivated	—	J. C. Shaver, Heaters, Braxton
334	.167	.057	0.61	1.97	1000	Some L	Corn, grain	*F	Brewster Estate, Holly, Braxton
340	.068	.030	0.65	0.91	3600	Some M, AP	Hay, weeds, grasses	F	J. F. Miller, Cowen, Webster
341	.272	.059	1.41	3.19	4200	None	Not cultivated	—	W. H. Cunningham, Webster Spr'gs, Webster
Ave.	.186	.055	1.03	2.25	5600				

MISCELLANEOUS SOILS

11	.075	.031	0.95	0.88	800	Mixed fert & L once	Tomatoes, wheat, clover	F	Mr. Henry, Stotlers Cross Roads, Morgan
20	.324	.038	0.37	8.78	3800	Unknown	Orchard	F	Ed. Leatherman, Keyser, Mineral
22	.144	.103	2.83	1.58	1800	Some M	Corn, wheat, clover	F	C. R. Morris, Martha, Cabell
25	.121	.071	2.57	1.45	1800	400 lbs 4-10-8 yearly	Orchard	G	John Miller, Martinsburg, Berkeley
27	.215	.057	2.01	1.24	1400	Some 4-8-7	Orchard	F	Gray Silver, Martinsburg, Berkeley
30	.123	.065	1.96	1.24	1800	Some M & comp fert	Corn, oats, wheat	P	O. Aler, Martinsburg, Berkeley
31	.085	.037	1.08	1.01	200	Some M	Orchard	G	A. R. Feltner, Martinsburg, Berkeley
34	.127	.066	1.57	1.30	3000	Some M	Orchard	P	Dr. Shipper, Martinsburg, Berkeley
35	.130	.068	1.95	0.90	2400	Some AP	Corn, clover, grass	F	Geo. Schroades, Martinsburg, Berkeley
41	.106	.024	0.60	1.93	5000	.....	Unknown	—	E. P. Foster, Gauley Bridge, Nicholas
44	.255	.079	1.10	2.85	6800	None	Meadow	*F	L. E. McClung, Rupert, Greenbrier
45	.184	.035	0.85	1.92	4000	None	Meadow	*F	J. O. McClung, Rupert, Greenbrier
46	.141	.058	0.69	1.42	2600	Some M, AP	Corn, grain, hay	F	D. Tuckwiller, Lewisburg, Greenbrier
48	.116	.061	1.62	1.45	5600	None	Unknown	—	Mr. Bradberry, Sherman, Jackson
68	.199	.046	1.23	2.28	1600	None	Pasture, swamp grass	*P	B. T. Gibson, Masontown, Preston
117	.161	.074	1.38	1.66	3300	Some M, AP	Corn, wheat, timothy, clover	F	I. E. Moore, Huntersville, Pocahontas
119	.211	.080	0.85	2.33	4900	Heavy M, AP	Corn, wheat, timothy, clover	G	W. G. Cochran, Onoto, Pocahontas
122	.274	.086	1.46	2.80	5400	Med amts AP, M	Corn, grain, clover, alfalfa	G	Uriah Heavener, Boyer, Pocahontas
125	.133	.064	0.76	1.59	2000	None	Corn, grain, clover	G	Mr. White, Lewisburg, Greenbrier
128	.182	.070	2.09	1.58	3100	None	Bluegrass, red top	P	————, Union, Monroe
129	.216	.090	1.96	1.93	1100	Med amts AP, M	Corn, wheat, clover, timothy	F	J. E. Hansbarger, Peterstown, Monroe
130	.134	.028	0.99	1.32	2100	Some AP, L, M	Corn, wheat, clover, timothy	G	J. E. Hansbarger, Peterstown, Monroe
134	.128	.059	0.56	1.40	2700	None	Corn every year	G	————, Gap Mills, Monroe
139	.130	.043	0.95	1.18	2500	Some M, AP	Corn, grain, clover, timothy	*F	I. Grimmett, Buck, Summers
140	.118	.028	0.96	1.11	3000	Some comp fert	Corn, wheat, clover, timothy	F	T. G. C. Grimmett, Buck, Summers
142	.091	.031	0.88	0.89	3000	Some comp fert	Corn, wheat, clover	F	I. W. Serrell, Forest Hill, Summers
149	.281	.054	1.05	3.36	6100	None	Red top, swamp grass, timothy	*P	N. T. Nutter, Persinger, Nicholas
152	.244	.057	1.49	2.81	6300	None	Meadow	*F	K. B. McCue, Muddlety, Nicholas
171	.194	.093	0.87	2.01	6700	None	Red top, grass	F	Dr. McCleary, Wheeling, Ohio
190	.172	.083	1.92	0.84	1200	Some AP, L, M	Corn, wheat, clover, timothy	F	A. C. Boggs & Son, Harman, Pendleton
191	.081	.025	1.52	0.56	1300	Med amts AP, L	Corn, wheat, meadow	F	C. E. Hedrick, Harman, Pendleton
193	.043	.022	1.50	0.21	2300	None	Bluegrass sod	F	J. F. Bennett, Franklin, Pendleton
197	.152	.053	1.75	0.78	2800	None (muck soil)	Corn, wheat, timothy	G	S. B. McClung, Franklin, Pendleton
198	.164	.066	2.04	0.84	400	Med amts AP, M	Corn, wheat, clover, timothy	G	O. R. Mallow, Franklin, Pendleton
204	.188	.053	1.26	1.07	0	Some M	Corn, grain	G	H. Whiting, Shepsherdstown, Jefferson

MISCELLANEOUS SOILS (Continued)

Soil No.	Percentage of Elements P	Percentage of Elements C	Req'm't $CaCO_3$ Lbs. Per A.	Kinds and Amounts of Fertilizer Used	Crops Generally Grown and Yield		Owner, Address, and County
206	.101	7.54	0.55	200	None	Poverty grass P	————, Martinsburg, Berkeley
208	.128	2.67	0.59	1300	Heavy M, AP, some L	Corn, wheat, clover, grass F	C. N. Stuckey, Jones Springs, Berkeley
210	.136	1.10	0.80	2600	Heavy M	Corn, wheat, clover F	William Linton, Jones Springs, Berkeley
213	.121	3.11	1.10	100	None	Corn G	G. M. Knott, Shepherdstown, Jefferson
221	.182	2.24	1.04	0	None	Barren soil P	E. Vanrensellaer, Berkeley Springs, Morgan
223	.145	1.36	1.23	0	None	Corn F	J. W. Hovernale, Berkeley Springs, Morgan
226	.105	1.44	0.69	800	None	Orchard grass, crimson clover F	Sleepy Cr. Or. Co., Berkeley Spr'gs, Morgan
227	.184	2.07	0.87	2400	None	Tomatoes, corn, wheat P	C. F. Miller, Cherry Run, Morgan
230	.147	1.62	0.94	0	None	Orchard F	W. S. Funkhouser, Moorefield, Hardy
231	.099	1.63	0.45	1400	Med amts M, AP	Corn, wheat, clover F	G. Methias, Methias, Hardy
233	.538	1.31	2.99	0	None	Corn, grass *F	F. Snyder, Wardensville, Hardy
234	.074	0.71	0.43	200	None	Grass, weeds *P	State Farm, Wardensville, Hardy
235	.108	0.92	0.61	200	Some M	Corn, grass *F	State Farm, Wardensville, Hardy
236	.260	1.28	1.45	2000	None	Corn G	State Farm, Wardensville, Hardy
237	.195	2.20	0.96	1000	Some AP, L	Corn, wheat, grass G	H. Bosley, Moorefield, Hardy
238	.292	2.38	1.37	2600	None	Corn, wheat, clover G	A. Cunningham, Moorefield, Hardy
267	.166	1.43	1.86	5200	None	(Soil along river) —	A. Workman, St. Albans, Kanawha
283	.164	0.92	1.95	5200	None	Not cultivated —	A. M. Allender, Grafton, Taylor
291	.153	1.19	1.80	2200	Med amts AP, L, M	Corn, rye, vetch, clover G	W. D. Zinn, Philippi, Barbour
294	.088	0.66	1.69	400	None	Rough stony land —	A. H. Bolyard, Philippi, Barbour
296	.124	0.97	1.52	400	Med amts AP, L, M	Corn, grain, clover G	————, Elkins, Randolph
300	.148	2.00	1.14	7000	None	Weeds, grass F	H. W. Hutton, Huttonsville, Randolph
302	.267	1.13	2.75	0	Some AP, M, L	Corn, grass F	F. P. Marshall, Mingo, Randolph
321	.244	1.03	5.21	0	Heavy M	Garden, truck crops *F	J. H. Bailey, Weston, Lewis
336	.238	1.10	3.12	5200	Some AP, L	Corn, wheat, grass F	L. D. Smith, Cowen, Webster
338	.491	0.90	5.98	1200	None	Moss, weeds *P	F. Smith, Cowen, Webster
371	.489	1.80	5.27	1000	Some AP, L, M	Corn, wheat, clover G	W. A. Leatherman, Keyser, Mineral
381	.153	0.64	1.23	1400	Some M, & L once	Corn, wheat, clover G	S. H. Williams, Romney, Hampshire
382	.279	0.58	3.77	0	None	Orchard G	Mr. Taylor, Romney, Hampshire
383	.159	0.70	1.41	2400	Med amts AP	Corn, wheat, hay G	S. H. Williams, Romney, Hampshire
384	.107	1.37	2.03	3600	None	Grass, clover P	————, Romney, Hampshire
391	.133	0.77	1.55	4500	Some M	Potatoes *P	Mr. Johnson, Princeton, Mercer
423	.112	1.03	1.19	2600	None	Meadow, some clover F	————, Low Gap, Boone
440	.257	0.57	6.55	200	L once	Corn, oats, clover F	Polly Farm, Davis, Tucker
484	.297	1.28	1.84	2400	None	Meadow, some clover F	R. Lambert, Crumpler, McDowell
Ave.	.178	1.44	1.83	2300			

TABLE III.—Average Content of Nitrogen, Phosphorus, Potassium, and Carbon, and the Average Lime Requirement of the Important Soils in West Virginia.

Soil Series	Analyzed Samples	Percentage of Elements Average				Average $CaCO_3$ Lbs. per Acre	Remarks
		N	P	K	C		
Brooke	7	.176	.064	1.71	1.87	1800	Good soil
Hagerstown	30	.139	.062	2.48	1.11	500	Good soil
Huntington	51	.169	.062	1.26	2.08	2400	Good soil
Moshannon	22	.154	.055	1.27	1.57	3000	Good soil
Westmoreland	11	.194	.073	1.54	2.01	2300	Good soil
Wheeling	13	.149	.104	1.10	1.61	2100	Good soil
Dekalb	151	.137	.043	1.11	1.65	3200	Poor to fair soil
Meigs	26	.128	.043	1.25	1.36	3100	Poor to fair soil
Holston	36	.129	.047	1.06	1.43	2800	Poor to fair soil
Tyler	16	.137	.046	1.14	1.38	3200	Poor to fair soil
Upshur	39	.146	.046	1.48	1.56	3100	Fair soil
Elk	6	.142	.045	1.00	1.53	1600	Fair soil
Pope	7	.186	.055	1.03	2.25	5600	Fair soil
Miscellaneous Soils	70	.178	.058	1.44	1.82	2300	
Weighed Ave.	485	.150	.052	1.31	1.65	2700	

Soil fertility problems can not always be solved in a short time. Several years of field investigation may be necessary to determine the limiting factors. However, the conclusions in this report should not be very far from correct because of the large number of soils studied. The correlation between the amounts of plant nutrient elements in the soil with the fertility is important both from a scientific and a practical viewpoint.

In general, the data indicate that the availability of the plant nutrients is proportional to the amounts of the elements in the soil and to the degree to which good soil management is practiced. Most crops are indirectly dependent for a large part of their nutrients upon the decomposition of roots, stems, leaves and other forms of organic matter in the soil. The nutrients in the organic matter are made available during the process of decomposition, and the carbon dioxide evolved aids in the solution of mineral matter. There is to a certain extent a rotation of the nutrients from one crop to another. Frequent and liberal applications of farm manures, green manures, and other forms of organic matter are highly recommended to help maintain the supply of available plant nutrients in the soil.

It must be recognized that maximum crops can not be produced on soils which are low in phosphorus and nitrogen, unless these are added in a form which can be easily utilized by the plants. This is true for potassium and lime also. If the soil is very acid no permanent improvement can be made without the addition of lime. It should be understood, however, that lime alone will not restore the fertility to all acid soils. Lime will correct the acidity and make the soil more active, but it does not supply any of the other plant nutrients that may be deficient. Under a careful system of crop rotation, including a legume every two or three years, the greater part of the nitrogen may be supplied from the atmosphere, but the phosphorus, potassium, and lime must be added in case they are deficient. When clovers fail, very likely the soil needs lime and phosphates.

Recent investigations[1] show that the value of the crop yields on many of the soils in West Virginia is less than the cost of production. In order to avoid this loss, the farmer will have to adopt a system of crop rotation including more legumes, a more economical use of farm manures and the use of liberal amounts of phosphate fertilizers and lime. Many of the less productive soils will give profitable returns with the use of complete fertilizers.

SUMMARY AND CONCLUSIONS

The content of nitrogen, phosphorus, potassium, and carbon, and the lime requirement of 485 soil samples representing the important series in West Virginia have been determined. The general fertility and conditions of these soils are discussed. The results may be summarized as follows:

1.—The soils derived from sandstone and shale have a lower content of nitrogen and phosphorus than do the soils derived from limestone. The sandstone and shale soils are more acid and less fertile than the limestone soils.

2.—About 50 per cent of the Dekalb and Meigs series, and about 33 per cent of the Tyler, Holston, and Upshur series have less than .04 per cent phosphorus. These soils are of low fertility.

3.—More than 45 per cent of the Dekalb, Meigs, Upshur, and Holston soils contain less than .12 per cent nitrogen. In general, the nitrogen is in proportion to the organic carbon in all the soils studied; it is about 8 to 10 per cent of the carbon for most of them.

[1]Unpublished data, Department of Farm Economics, W. Va. Agr. Exp. Sta.

4.—More than 90 per cent of all the sandstone and shale soils are acid, and are not very fertile. An average of 3000 pounds of lime per acre is required to neutralize the acidity of the sandstone and shale soils.

5.—Poor drainage conditions, no doubt, limit the productivity of many of the soils in the state. This is particularly true with some of the Tyler and Holston soils.

6.—All of the soils average 1 per cent potassium or more. A few sandy ones are low in potassium. Many of these sandy soils and others which are low in organic matter will probably respond to potash fertilizers.

7.—There is a fairly good correlation in all the soils studied between the nitrogen, phosphorous, the carbon, the lime requirements, and the fertility. In general, the higher the nitrogen and phosphorus, and the lower the lime requirement, the higher is the fertility.

8.—Most of the sandstone and shale soils respond to acid phosphate, nitrates, manures, and lime. These soils comprise over 80 per cent of the soils in West Virginia.

9.—The Brooke, Hagerstown, Westmoreland, Huntington, Moshannon, and Wheeling soils are in general more fertile and less acid than the sandstone and the shale soils. The first three soils have a limestone origin; the last three are river flood plain soils, but contain some material washed from limestone formations.

10.—The limestone soils contain an average of .06 per cent phosphorus or more, and about .15 per cent nitrogen. The potassium in the Hagerstown soils averages much higher than in the other soils, but the organic carbon is lower.

11.—Soils which contain less than .12 per cent nitrogen, and less than .04 per cent phosphorus have, in general, a low fertility. There are, however, many soils in the state which contain much higher amounts of nitrogen and phosphorus, and are still unfertile.

12.—Lime, acid phosphate, and nitrogenous fertilizers will very likely give profitable returns on most of the sandstone and shale soils, and in many cases also on the limestone soils.